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Moped Crashes in Queensland

by N Haworth, A Nielson and K Greig

Centre for Accident Research and Road Safety-Queensland, Queensland University of Technology, Australia

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Abstract

Motor scooter and moped sales are booming, but little is known about their crash involvement. In Queensland, most scooters are mopeds which can be ridden with a car licence only. This paper begins by defining scooters and mopeds and discussing the difficulties in identifying them in crash and other data bases. It then presents the results of analyses of moped crashes identified from crash and registration data supplied by Queensland Transport.

The registration data classed 227 vehicles in crashes as mopeds but further examination of make and model information identified an additional 79 mopeds. The number of moped crashes increased from 25 in 2001 to 97 in 2005, with larger percentage growth in crashes of riders licensed in Queensland than elsewhere. The most common crash types were “angle” (37%) and “fall from vehicle” (23%).

Moped crashes were more likely to occur in tourist areas, on weekdays and in low speed zones than motorcycle crashes. The distributions of crash type and crash severity were similar. Moped riders in crashes were much more likely than motorcycle riders to be female (37.9% versus 7.2%), younger and hold an interstate (10.8% versus 1.3%) or overseas licence (7.8% versus 0.7%).

The challenges in interpreting the results of the analyses of the crash data are discussed.

Introduction

Australia, in common with other developed countries, is experiencing a boom in the sales and use of motorcycles. The number of motorcycles registered increased by 20% from 2001 to 2005 (1), the strongest growth of any vehicle type in Australia. From a public health perspective, the increase in motorcycling presents an enormous challenge because motorcycle riders and their pillion passengers are especially vulnerable in crashes. Across Australia, the number of motorcyclist (rider and pillion) fatalities has risen from 175 in 1997 to 238 in 2006 (2). There have been two major changes that have contributed to the growth in motorcycling – more older riders and the growth in popularity of scooters and mopeds.

While the increase in older riders began in the 1990s, in the last decade sales of new motor scooters and mopeds have increased more than other powered two-wheelers. National sales figures for January to June 2006 (3) show that new scooter and moped sales increased by 64.4% from the same period the previous year (which had recorded a 30% growth from the previous year). New scooters and mopeds are now the largest segment of the on-road motorcycle market. Mopeds comprised five of the ten best-selling new on-road motorcycles in Australia in January to June 2006.

The lack of an official definition of a motor scooter means that crash and registration data for these vehicles are not easily available. Informally, vehicle design is commonly used to differentiate between a motorcycle and a scooter. A motorcycle has a step-over design where the rider must step over the vehicle to mount it. Scooters have a step-through design, most have automatic transmissions and most (but not all) have small engines. Mopeds are defined in the Australian Design Rules as powered vehicles with two or three wheels, an engine cylinder capacity not exceeding 50 ml and a speed not exceeding 50 km/h. Despite this definition, mopeds are not reliably identified in crash data in most Australian jurisdictions.

There is little Australian research regarding the safety of scooters and mopeds. Early investigations of moped safety in Australia included surveys of riders and preliminary crash data and investigations undertaken for a Victorian Parliamentary inquiry into the safety of mopeds (4). Several more recent Australian surveys of motorcyclists have included few scooters and mopeds in their samples (5,6).

Recent crash data for mopeds is sparse. In Western Australia (where mopeds can be ridden on a car licence), there were 257 mopeds in Police reported crashes in 1995 to 2004, less than 0.1% of all vehicles in crashes (7). While the numbers of moped crashes are very small, they do not appear to be markedly over-involved in serious crashes (fatal and hospitalisation) compared to their involvement in "other" crashes (0.1% versus less than 0.1%), unlike the pattern found for motorcycle crashes (7.9% versus 1.5%).

Most of the research into the safety of scooters and mopeds comes from Europe where these vehicles have traditionally been very popular. Studies from Sweden (8), Britain and Holland have reported higher crash risks for mopeds and scooters than other motorcycles, but studies in France and Greece have found similar crash risks (9). This research is of limited relevance to Australia, because until recently in many European countries, moped licences could be obtained by riders as young as 14 or 15 and helmet wearing was not mandatory in some countries for slow mopeds.

Given the increase in popularity of scooters and mopeds and the lack of current Australian information about their safety, an analysis of Queensland crash data was undertaken. Queensland has about one-third of all Australian scooter sales. Mopeds are allowed to be ridden with only a car licence, and comprised 83.6% of new scooter sales in the first half of 2005 (10). While scooters cannot be easily identified in the crash or registration data, mopeds are identifiable in the registration data, which provided the opportunity to analyse a matched crash and registration data file.

Method

Queensland Transport supplied spreadsheets containing registration details of all vehicles that were coded as motorcycles in their crash data for 2001-05; and crash and casualty information for crashes involving motorcycles. The crash and registration files were merged to allow the more specific vehicle information in the registration data (make, model and body type) to be used to distinguish the different types of powered two-wheelers in crashes.

The characteristics of the merged data set are summarised in Figure 1. There were 7609 powered two wheelers (PTWs) reported to be involved in road crashes from 2001 to 2005. The registration number was recorded for 7224 of these vehicles, allowing matching with the registration data. Of the vehicles for which registration number was not recorded, 253 (3.3%) were coded as unregistered, 58 (0.7%) were coded as "unknown", 69 (0.9%) coded as missing, and 5 were hit and run crashes.

Of the 7224 vehicles for which registration data was available, 1016 (14.1%) had no information on make, model, or body type. A further 552 were missing model information only. Where information on body type was available, 5965 (96.1%) were coded as motorcycles, 227 (3.7%) as mopeds, 8 (0.1%) as motor trikes, and 8 (0.1%) as sidecars.

How many of the PTWs coded as motorcycles are traditional stepover motorcycles and how many are scooters, or some other classification cannot be directly ascertained from the data.

Analysis of the make and model data revealed inconsistencies in the coding of body type. Among vehicles with the same recorded make and model, some were coded as motorcycles and others were coded as mopeds. In some instances, it is likely that the coding of body type was accurate and the apparent discrepancy resulted from the make and model information being sufficiently vague so as to include several variants of a PTW, some of which were truly mopeds and some of which were actually larger scooters (which are coded as motorcycles). In other cases, the coding of body type was inconsistent with the make and model information. This led us to reclassify body type, resulting in 306 vehicles being identified as mopeds for the analysis (see Figure 2).

Results

There were 306 mopeds involved in 303 crashes. Crashes involving mopeds increased from 25 in 2001 to 97 in 2005. The majority of crashes were hospitalisations (43%) or medical treatment (38%). Four were fatal, 52 were minor injury crashes (17%) and only one crash resulted in property damage only (see Table 2). In almost all crashes, the moped (or motorcycle) rider or pillion was the most severely injured in the crash.

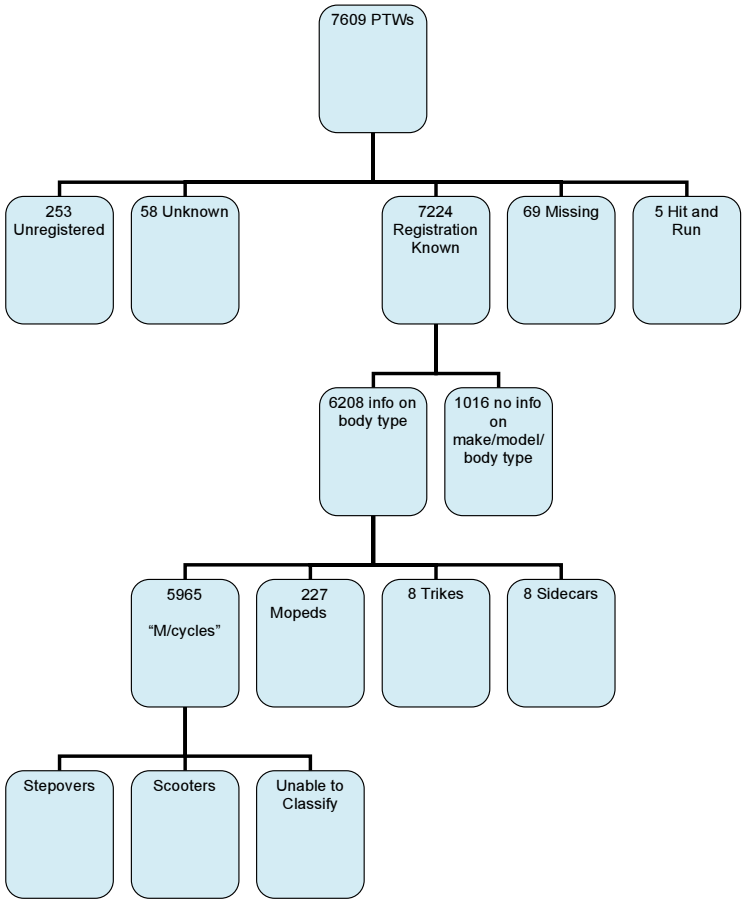

Figure 1. Initial classification of Powered Two Wheelers (PTWs) from merged Queensland Transport crash and registration data

Table 2. Numbers of Mopeds and Motorcycles in Crashes in Queensland 2001-2005 by Crash Severity

		Crash severity						
PTW type	**Year**	**Fatal**	**Hospitalisation**	**Medical treatment**	**Minor injury**	**Property damage**	**Unknown**	**Total**
Moped	2001	0	13	7	5	0	2	27
	2002	1	20	16	7	0	1	45
	2003	0	25	26	15	0	0	66
	2004	0	28	29	14	0	0	71
	2005	3	44	38	11	1	0	97
	Total	4	130	116	52	1	3	306
Motorcycle	2001	10	339	323	137	17	16	842
	2002	23	443	321	176	19	22	1004
	2003	37	575	399	196	12	31	1250
	2004	40	641	397	207	41	22	1348
	2005	54	708	422	211	25	22	1442
	Total	164	2706	1862	927	114	113	5886

Table 3 shows that only 30.4% of moped crashes occurred in the capital city, Brisbane, with large percentages in the Gold Coast, Townsville, Cairns and the Sunshine Coast. About 80% of moped crashes occurred between 6am and 6pm and on weekdays. Speed limits were 60 km/h or less for 86.1% of moped crashes. Overall, 50.8% of crashes occurred at intersections and 32.3% were single vehicle crashes. Angle collisions were the most common crash events (36.6%) followed by falls from the vehicle (22.9%). Other common crash types were rear end crashes (12.1%), sideswipes (11.4%) and hit object (10.8%).

Among the riders in moped crashes, 37.9% were female and 37.6% were in the 17-24 age bracket (see Table 4). Full licences (type unstated) were held by 65.7% of riders, with 10.8% holding a provisional or restricted licence and 8.2% holding a learner permit. Just over 5% were riding illegally (cancelled, disqualified, expired licence, unlicensed or never held a licence). Overall, 10.8% of riders held an interstate licence and 7.8% held an overseas licence. Among moped riders aged under 25, 21% had interstate licences and 14% had overseas licences. The increase in crash involvement was greater in Queensland-licensed riders (from 18 in 2001 to 82 in 2005) than in riders licensed interstate or overseas (from 6 in 2001 to 12 in 2005).

Comparisons of moped and motorcycle crashes

In this section, the vehicles which were classified as mopeds were compared with those that were classified as motorcycles (which included scooters that were not mopeds). Vehicles that were unable to be classified (e.g. because of missing registration data) were omitted. Thus, the comparison includes 306 mopeds and 5886 motorcycles in crashes (rather than the total 7609 powered two-wheelers in the original crash data).

During 2001-2005, there were 19 motorcycle crashes for every moped crash (see Table 2). Young riders were involved in 24% of motorcycle crashes and 38% of moped crashes (see Table 4). The number of motorcycle crashes involving young riders increased by 83% during this period, the number of moped crashes with young riders increased by 208%. The severity profiles of motorcycle and moped crashes were similar [$\chi 2(3) = 5.83$, $p=0.12$] (Table 2).

Moped crashes were less likely than motorcycle crashes to occur in the Brisbane area and more likely to occur on the Gold Coast and in the Townsville area (see Table 3). Similar proportions of moped and motorcycle crashes occurred in daytime, but moped crashes were more likely to occur on weekdays (79.5% versus 70.5%). Relatively more moped than motorcycle crashes occurred at low speed zones: 86.1% of moped crashes and 69.4% of motorcycle crashes in speed zones of 60 km/h or less. Similar proportions of moped and motorcycle crashes occurred at intersections and similar proportions were single vehicle crashes. The distributions of crash type were also similar.

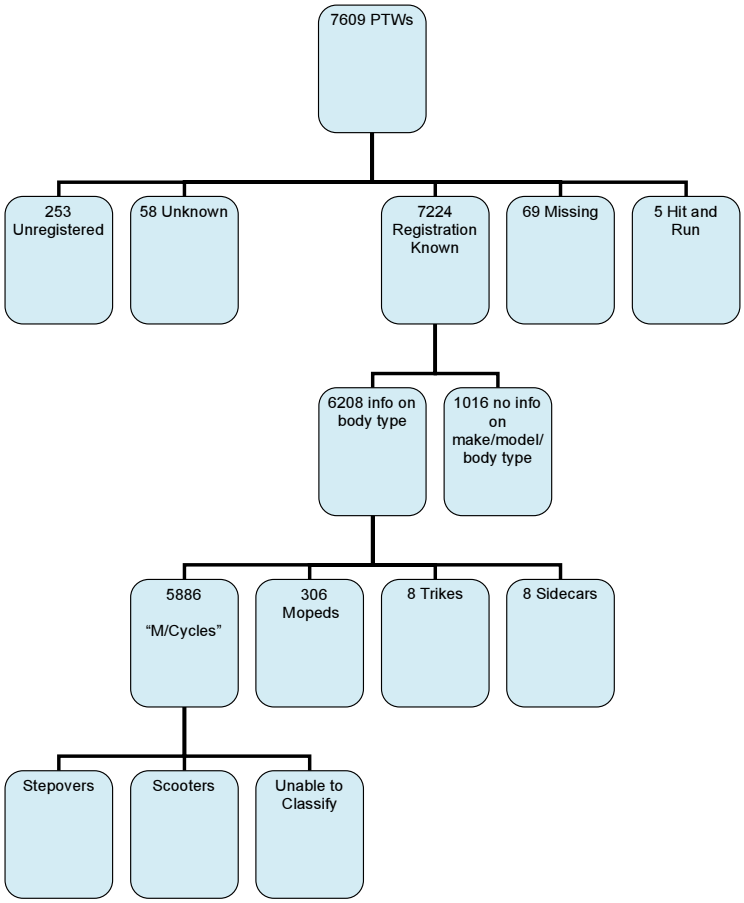

Figure 2. Reclassification of Powered Two Wheelers (PTWs) from merged Queensland Transport crash and registration data

Moped riders in crashes were much more likely than motorcycle riders to be female (37.9% versus 7.2%). Moped riders were younger on average, with 37.6% being aged 17-24, compared with 23.7% of motorcycle riders in crashes. Moped riders in crashes were much more likely to hold an interstate (10.8% versus 1.3%) or overseas licence (7.8% versus 0.7%) than motorcycle riders.

Discussion

The results show that the number of mopeds in crashes roughly quadrupled from 25 in 2001 to 97 in 2005, reflecting recent increases in moped sales. While there are many fewer mopeds than motorcycles in crashes, the trend suggests that the issue of moped safety is becoming increasingly important.

Table 3. Characteristics of Crashes of Moped and Motorcycle Riders

Crash characteristic		Level	Moped crashes %	Motorcycle crashes %
Location*	Brisbane area	30.4	40.7	
	Gold Coast	18.3	10.5	
	Sunshine Coast	4.9	7.4	
	Cairns area	7.8	3.8	
	Townsville area	15.7	5.1	
	Other areas	22.9	32.5	
				$X^2(5)=103.09, p<0.01$
Time of day	6am – 6pm	79.9	79.1	
	6pm – 6 am	20.1	20.9	
				$X^2(1)=0.11, p=0.74$
Day of week*	Weekday	79.5	70.5	
	Weekend	20.5	29.5	
				$X^2(1)=10.94, p=0.01$
Speed zone*	40 km/h	1.3	1.6	
	50 km/h	21.8	11.9	
	60 km/h	63.0	55.9	
	70 km/h	4.6	5.8	
	80 km/h	5.9	10.2	
	90 km/h	0.3	0.4	
	100 km/h	3.0	13.7	
	110 km/h	0.0	0.3	
				$X^2(7)=56.76, p<0.01$
Intersection	Yes	50.8	47.7	
	No	49.2	52.3	
				$X^2(1)=1.86, p=0.30$
Number of vehicles	Single vehicle	32.3	33.0	
	Multiple vehicle	67.7	67.0	
				$X^2(1)=2.39, p=0.97$
Crash type	Angle	36.6	34.7	
	Fall from vehicle	22.9	23.5	
	Hit object	10.8	13.2	
	Rear-end	12.1	12.2	
	Sideswipe	11.4	9.0	
	Other (including hit parked vehicle, head on, hit animal, hit pedestrian)	5.2	8.3	
				$X^2(5)=5.08, p=0.41$

* indicates significant difference between mopeds and other motorcycles

Table 4. Characteristics of Moped and Motorcycle Riders in Crashes

Rider characteristic	Level	Moped riders %	Motorcycle riders %	
Gender*	Male	62.1	92.1	
	Female	37.9	7.2	
	Unknown	0.0	0.7	
				$X^2(1)=346.67$, $p<0.001$
Age group*	0-16	0.0	0.2	
	17-24	37.6	23.7	
	25-29	13.1	15.0	
	30-39	16.0	27.4	
	40-49	14.4	20.8	
	50-59	9.5	9.3	
	60-74	6.5	2.5	
	75 and over	1.6	0.2	
	Unknown	1.3	0.7	
				$X^2(8)=91.82$, $p<0.001$
Licence status*	Open/full	65.7	79.6	
	Provisional/restricted	10.8	7.5	
	Learner	8.2	6.6	
	Not licensed Australia	7.2	0.6	
	Not known	2.0	0.6	
	Not applicable	1.0	0.4	
	Unlicensed (including disqualified, expired, never licensed)	5.2	4.6	
				$X^2(1)=150.43$, $p<0.001$
Licence issued*	Queensland	77.1	96.4	
	Interstate	10.8	1.3	
	Overseas	7.8	0.7	
	Unknown	4.2	1.6	
				$X^2(1)=326.79$, $p<0.001$

* indicates significant difference between mopeds and other motorcycles

Yet the method of identifying mopeds in crashes used in this research is likely to have missed some mopeds. Only those mopeds in crashes where registration number was recorded in the crash data and the registration data contained information on body type could be identified. Overall, body type was unable to be identified for 18% of powered two-wheelers in crashes. The percentage of missing data was greater for crashes in 2001 (36%) and 2002 (30%) than in 2003-2005 (9-11%). Body type was more often unable to be identified for vehicles in fatal and hospitalisation crashes (28% and 21%) than for vehicles in medical treatment, minor injury and property damage crashes (15-16%). The dynamic nature of the registration data underlies these trends: vehicles in less recent crashes are less likely to be currently registered, and vehicles in more serious crashes are more likely to have been written off. The implication is that the estimate of the number of mopeds in crashes is likely to be somewhat low, with greater underestimation of mopeds (and motorcycles) in earlier and more severe crashes. Thus, the trends in growth of moped (and motorcycle) crashes reported here may be over-stated to some extent because of the greater difficulty in identifying earlier crashes. While scooters that do not fit the definition of a

moped were unable to be separated from other motorcycles in the analyses, this is unlikely to have markedly influenced the results, given that 83.6% of new scooter sales in Queensland are mopeds (10).

The Queensland crash data analysed here suggest that while moped crashes largely occur in low speed areas, their severity is similar to motorcycle crashes. This belies the marketing image of mopeds as small and slow and safe, no harder to ride than a bicycle. It also conflicts with the greater severity of motorcycle than moped crashes in Western Australia (7). The relatively small number of moped crashes in both studies may underlie this discrepancy. The coarseness of severity coding in the Police crash data also complicates the interpretation of this finding. Given the survey data suggesting that scooter riders are less likely to wear protective gear (5), it could be that the "hospitalisation" injuries of scooter riders are largely lacerations but those of motorcycle riders are fractures. Better injury data is needed to address the issue of the relative severity of moped and motorcycle crashes.

While the data provide a useful picture of moped crashes, they say nothing about whether moped riders are more or less likely to crash than motorcyclists. There is no reliable measure of moped and motorcycling activity (exposure to risk) available for comparison with the crash numbers. Numbers of licences held is problematic as an exposure measure for motorcycle riders (11) and licences are not required for mopeds. If registration numbers were made available, this would not account for potential differences in distances travelled by motorcycles and mopeds. There is a lack of detailed exposure data for PTWs, such as the time of day that trips occur, the reasons for travel, rider demographics, and PTW type (motorcycle, scooter, moped) which is needed for calculation of crash rates that allow meaningful comparisons of risk. So it is not known if mopeds are safer than motorcycles.

The data suggest that tourism contributes to moped crashes, particularly of young riders, but is not the most important factor. About 18% of moped riders were licensed interstate or overseas compared with only about 2% of motorcycle riders. The growth has been greater in moped crashes involving Queensland riders than those licensed elsewhere and relatively few older moped riders were licensed interstate or overseas. Thus, the popularity of moped riding in Queensland appears to have two components, with tourism contributing more for younger riders and commuting contributing more for older riders.

The data support the role of inexperience in moped crashes, particularly the number of "fall from vehicle" crashes. The licensing variables do not indicate whether or not the rider held a motorcycle licence. It is likely that many riders did not. The findings of these analyses reflect the nature of moped use in Queensland, where the ability to ride a moped on a car licence means that many moped riders are not only young but also inexperienced riders of powered two wheelers (and a significant number are riding in unfamiliar conditions). In other jurisdictions where a motorcycle licence is required to ride a moped, there are likely to be many fewer moped riders and perhaps the population of riders may be better trained and more experienced. It would be useful to undertake a similar data analysis in another State, if the numbers of moped crashes were sufficient to allow meaningful calculations.

Conclusions

The analyses presented here show that while moped crashes comprised only a small fraction of on-road crashes of powered two-wheelers in 2001-05, they are increasing at a faster rate than motorcycle crashes. The similar severity of moped and motorcycle crashes suggests that moped crashes merit further investigation. Data and definitional issues need to be addressed to better understand moped crashes and to provide a basis for decisions about moped licensing.

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